quantum

Instrument Handbook

Quantum Outdoor
Environmental Noise
Monitor

Cirrus
Research plc

About this manual

The instructions in this user manual refer to the operation of Cirrus Research plc Quantum Outdoor Cloud-Based Noise Monitoring System.

The instruments described in this manual are the Quantum Outdoor (CR:920 and CR:920-NA) and Outdoor All Weather Power Supply Unit (CU:920).

This manual describes the recommended usage of the Quantum Outdoor. Any warnings will be indicated by the following symbol:

The additional information required for testing in accordance with IEC 61672 is provided as a supplementary document, Quantum Outdoor Technical Data Part B, which is available for download at:
www.cirrusresearch.co.uk/library/user-manuals/

It is not possible to change the way that the instrument measures through the software or firmware. Any legal metrology aspects of the instrument cannot be affected by any changes made in the instrument.

The Common Specifications section on page 27 defines which standards relate to the different functions available in the instruments. Additional approvals and certifications may apply to the instruments, and these will be listed in the Appendices.

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Updates

In the interests of continuous product improvement, Cirrus Research plc reserves the right to make changes to product specifications without notice.

To understand the latest updates that have been implemented into this product and to download the most current version of this user manual, visit our website at www.cirrusresearch.co.uk

Revision 1 | November 2021

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1   Introduction

Welcome to your Quantum Outdoor. This next-generation instrument from Cirrus Research plc is powerful yet simple to use and is capable of a wide range of noise measurement functions.

Bird spike

Microphone windshield

Outdoor microphone assembly

GPS antenna

Outdoor microphone assembly

WiFi antenna (back)

Modem antenna

Modem antenna (front)

External power 12V input

Modem antenna connection

Weather station connection

Vent

AUX antenna connection

WiFi antenna connection

Ethernet (PoE) input
(behind removable cap)
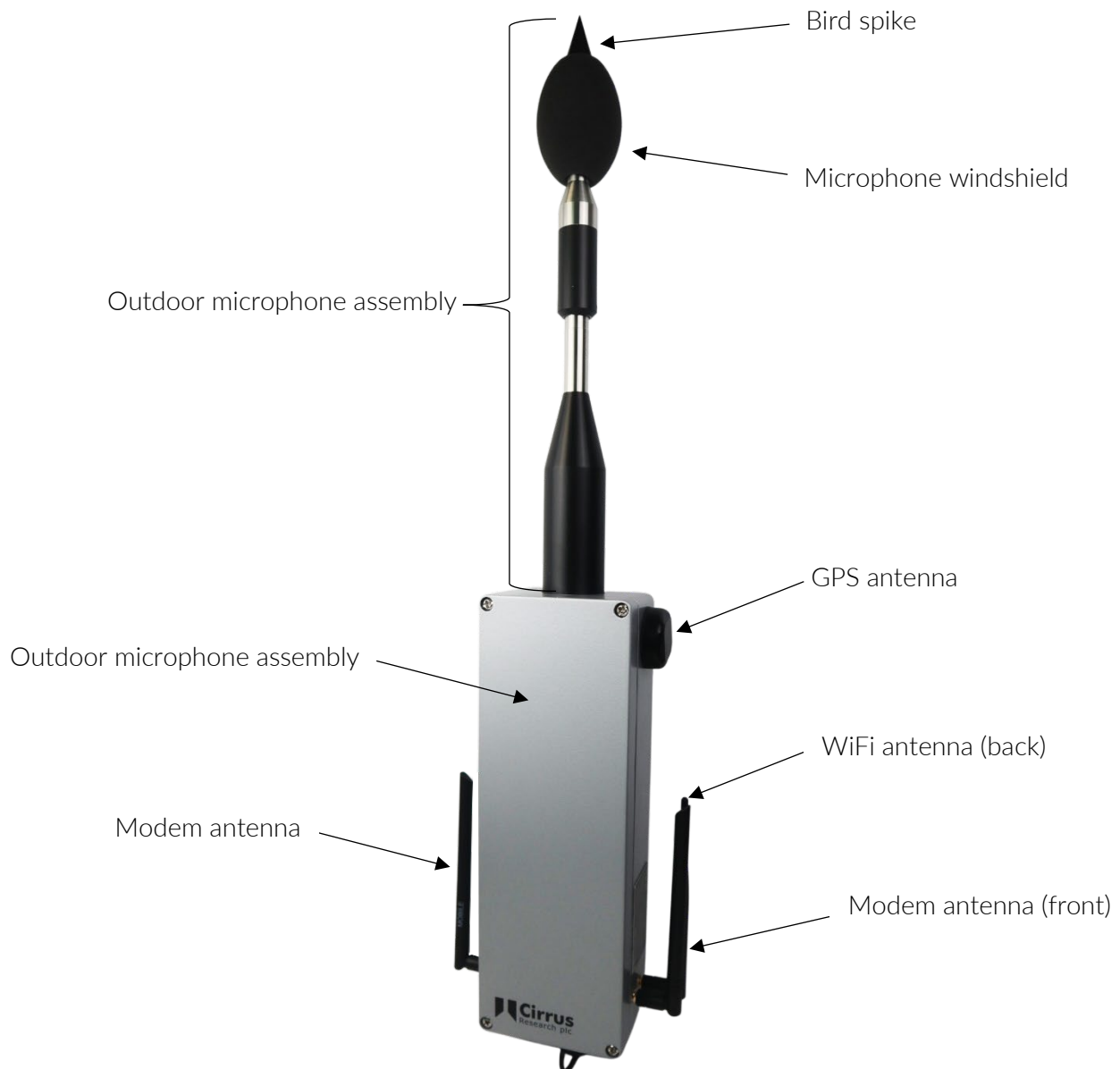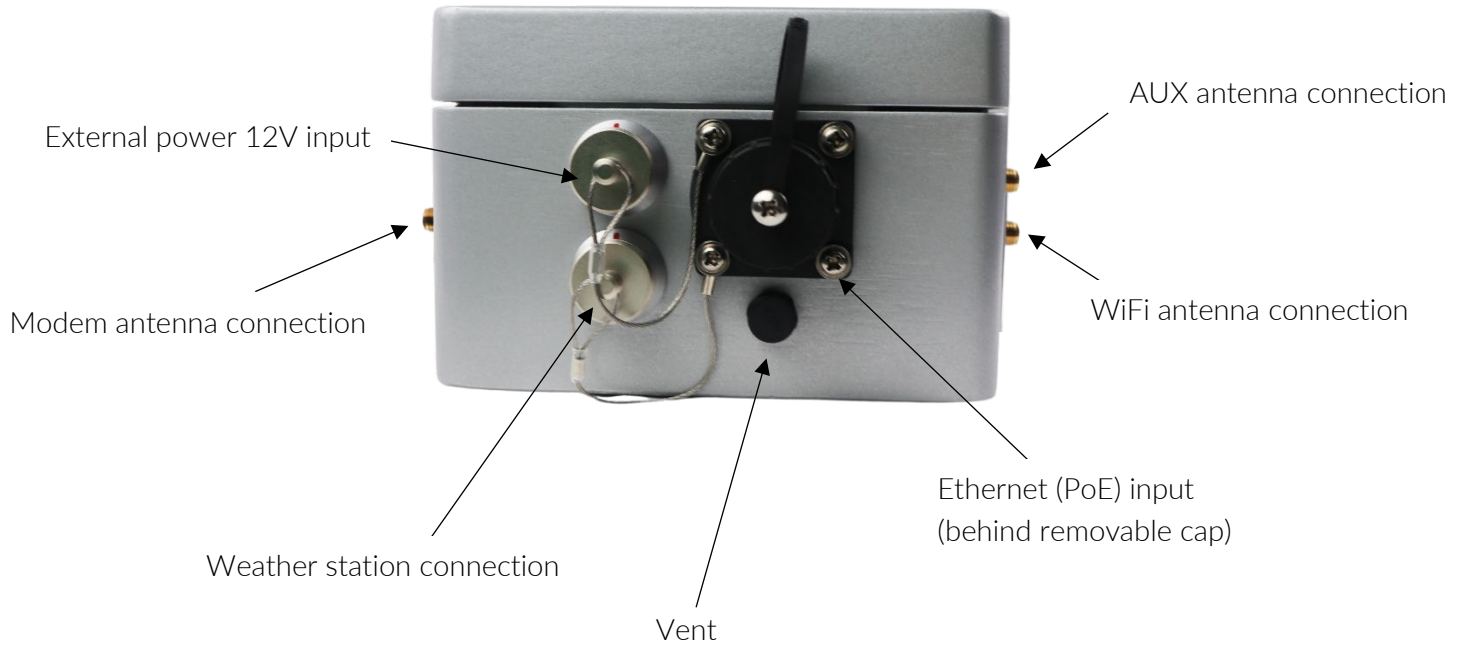
2   First use

Your Quantum Outdoor has been shipped in reusable packaging that should be retained for safe shipment when returning the instrument for calibration or servicing.

All Quantum Outdoor devices come with the following standard accessories:
- Microphone capsule (attached to the preamplifier)
- Windshield (UA:440)
- Antennae x 3 (2 x mobile, 1 x WiFi)
- RJ45 weatherproof backshell
- Pole mount straps
- Quick Start Guide

Optional accessories
- MO:901 Weather station and accessories
- MO:902 Wind Sensor
- CU:920 Power supply
- BK:901 Wall mount kit for Quantum Outdoor

The user manual is available online at https://www.cirrusresearch.co.uk/library/user-manuals/

You may have other accessories, depending on your package.

Damage caused by misuse is not covered by the warranty for the instrument.

NOTE:
Some of the features discussed in this manual may only be accessible depending on the cloud subscription you have selected. For full details, please visit www.cirrusresearch.com or speak to your sales representative.

3   About your Quantum Outdoor

The Quantum Outdoor is a cloud-connected noise monitor suitable for environmental noise measurement. Standard accessories supplied with the unit allow it to be mounted on a pole, and an optional bracket may be purchased to enable the monitor to be fitted to a wall.

Once installed, powered and connected to the MyCirrus cloud platform, Quantum Outdoor will automatically start measuring noise levels, which are sent and stored on the cloud for instant access through the easy-to-use Quantum portal. Live measurement data can be viewed in the Live Data view, and historical data can be viewed in the Historic Data view.

In order to operate your Quantum Outdoor a MyCirrus account is required. MyCirrus allows you to do the following:

- Set up a user profile and create your organisation
- Manage your Cirrus Research instruments
- Configure notification types
- Manage data storage
- Access the Quantum portal
- Manage your MyCirrus subscription

The Quantum portal allows you to view and analyse your measurements for any Quantum units from Cirrus Research. Briefly, the Quantum portal allows you to do the following:

- Configure instruments, notifications, organisation and subscriptions
- View live data
- View floor plans and noise levels for each instrument
- View maps and noise levels for each instrument
- View historical noise data
- Play audio recordings captured as part of a triggered noise event
- View weather data (if installed)
- Create detailed noise data reports
- Perform self-system checks with Quantum Outdoor's unique System Integrity Check (SiC)
- Download measurements to your local PC (.csv and .mtp for importing into NoiseTools)

The Quantum Outdoor needs to be linked to an active MyCirrus account and the Quantum portal for cloud connectivity.

Once connected, live noise data is available to view on the Quantum portal.

NB - live noise data is refreshed every second.

The measurement duration can be configured via the settings menu on the Quantum portal for a range of durations. Upon completion of a measurement, the data is then sent to MyCirrus and is available to view.

The measurement duration determines the time delay between making a measurement and it uploading to MyCirrus. For example, a 15-minute measurement duration will mean a 15-minute delay between the start of the measurement and it appearing on the Quantum portal

The sample rate of historical measurement data can be configured to be between 1/100s to 1s, providing greater resolution than live data.

Measurements sent to MyCirrus can then be viewed and analysed in the Quantum portal; noise measurement reports can also be created using this data.

Data stored on MyCirrus is secure. However, you can also export your measurement data to your local PC, where it can be backed up and imported into NoiseTools for further analysis.

See section 9 for time zone information.

Other key operational features available on Quantum Outdoor:

- IEC 61672-1:2013 Class 1 acoustic performance
- 20-140dB RMS measurement range in a single range
- Simultaneous noise measurements (time and frequency weighting, octaves, 1:3 octaves and more)
- Audio-triggered noise events and a range of notification options
- Weather data (optional)
- GPS location and time synchronisation
- System Integrity Checks (SiC)
- Connectivity - Wired LAN, WiFi or 3G/4G LTE modem connected
- Pre-installed SIM capable of connecting to multiple providers
- Power over Ethernet (PoE) or 12V DC-powered

4   Installation

4.1   Powering the Quantum Outdoor

Quantum Outdoor can be powered from industry-standard Power over Ethernet (PoE) or from the optional 12V DC power supply (CU:920). To power the unit, plug either or both supplies into the Quantum Outdoor unit.

See section 4.4 for details on how to fit the backshell to the ethernet RJ45 PoE connector.

Once fitted, remove the dust cover from the 'Ethernet (PoE) Input' show below, insert and screw in the Ethernet cable with backshell fitted.

See section 12 for further information regarding the CR:920 power supply. To plug the power supply into Quantum Outdoor, unplug the blanking plug from the external power 12V input as shown below and insert the connector from the power supply.

To remove the 12V power cable, hold the silver connector backshell close to the unit enclosure and pull: **DO NOT TWIST**.

4.2   Antennas

Antennas should be fitted, even if they are not being used, to protect the connectors. The modem and WiFi antennas have different connectors (one has a pin, and one has a socket) to ensure they are plugged into the correct ports (refer to the figure above to identify the correct connection points).

4.3   Pole mount instructions

Your Quantum Outdoor is supplied with pole mount brackets fitted as standard. By using the pole clamps supplied, the unit can be installed on a pole with a diameter between 50 and 178mm (2 and 7")

For optimal performance, position the unit at the top of the pole with the microphone assembly above it. It is recommended that the top of the pole is covered up using a cap to prevent the wind creating a whistling noise.

Feed the pole clamp straps through two of the slots on the brackets and secure with the strap nuts on the far side of the pole, using an 8mm (5/16") nut drive.

4.4   Wall mount instructions

The optional BK:901 kit allows the Quantum Outdoor to be wall mounted. This kit includes a T and K bracket and a 700mm (27.56") pole. The Quantum Outdoor should be mounted so that the microphone sits above the roofline to reduce acoustic reflections.
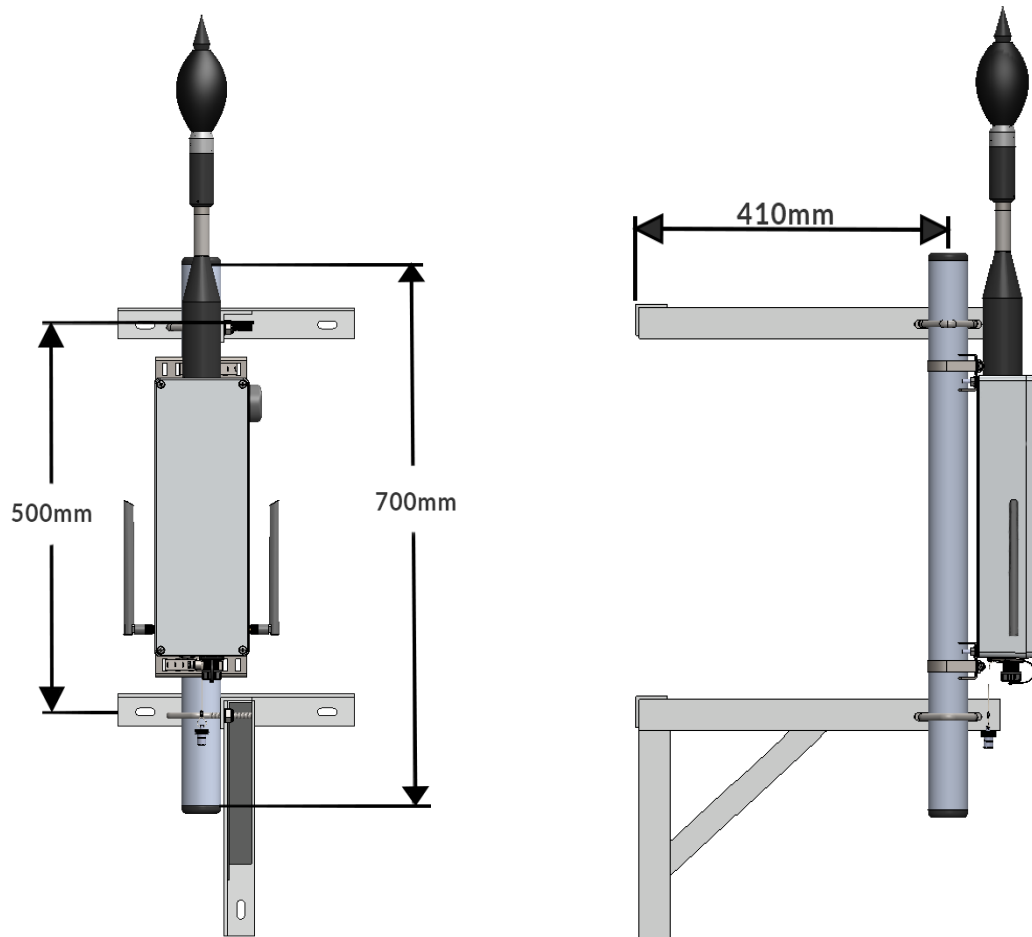
4.5   Fitting the RJ45 IP housing

The supplied ethernet backshell housing should be fitted to the ethernet cable, if used, to ensure a reliable watertight ethernet connection.

For a reliable electrical connection when fitted to the Quantum Outdoor, ensure the RJ45 connector is fully inserted into the mating RJ45 socket when the backshell housing is secured to the unit. It is recommended that any Ethernet cable used has a new RJ45 connector fitted without any strain relief, and the spacer supplied with the backshell housing is used to locate the RJ45 connector.

For reference, the manufacturer's part number for the IP67 backshell housing is Amphenol RCP-00BMMS-SLM7001.

Instructions:

Prepare your own RJ cable with an RJ plug and cable. With a diameter of between 5 and 6.5mm (0.2 and 0.25").

1) Insert through components in the order 4 to 1 accordingly (note the seal is a split seal).
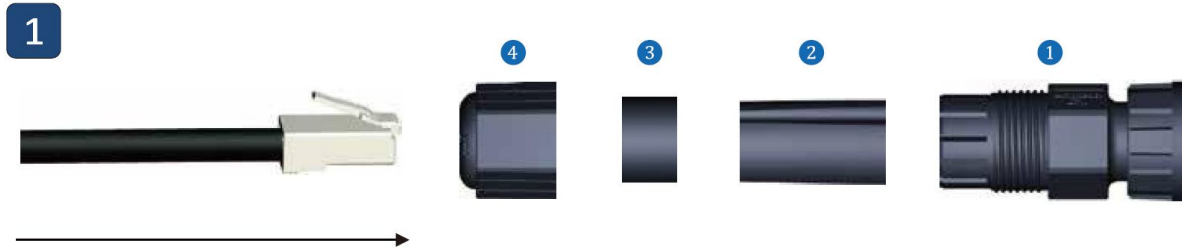
2) Push the spacer (2) into the body (1), then push in the seal (3) and secure by tightening the sealing nut (4) to the body (1) (torque force 0.5 to 1.5 Nm).

5   How to connect to MyCirrus

5.1   Network instructions
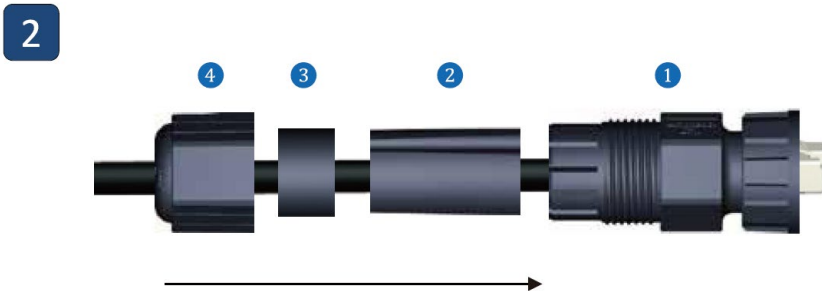
Refer to the Quantum Outdoor quick start guide for instructions on connecting and configuring your Quantum Outdoor to a wired network.

Quantum Outdoor will use a wired network connection as default if available, using WiFi or a modem as a fallback option.

5.2   WiFi instructions

Refer to the Quantum Outdoor quick start guide for instructions on connecting and configuring your Quantum Outdoor to a wireless network.

5.3   Modem instructions

Quantum Outdoor is pre-installed with a SIM capable of connecting to a number of networks. To use modem connectivity, the SIM should be enabled via MyCirrus. Please refer to the Quantum Outdoor quick start guide for further details.

6   Acoustic Calibration

We recommend that an acoustic calibration is performed after installation and regularly thereafter, typically once every 6 to 12 months.

To perform an acoustic calibration, access to the Quantum Outdoor and the Quantum portal on MyCirrus is required.

For ease of calibration, we recommend logging into your MyCirrus account using a mobile device, which can be used on-site where the instrument is installed.

We recommend performing an acoustic calibration with a Cirrus Research CR:515 Class 1 94dB 1kHz calibrator. Please note that the Quantum Outdoor applies a correction for pressure to free field of 0.3dB. Therefore, using a 94dB calibrator and performing acoustic calibration will result in a level of 93.7dB being read.

Instructions:

1) Remove the foam windshield and windshield holder by gently holding and squeezing the foam and unscrewing it in an anti-clockwise direction – this will expose the microphone.

Squeeze and turn anti-clockwise.

Grip here.
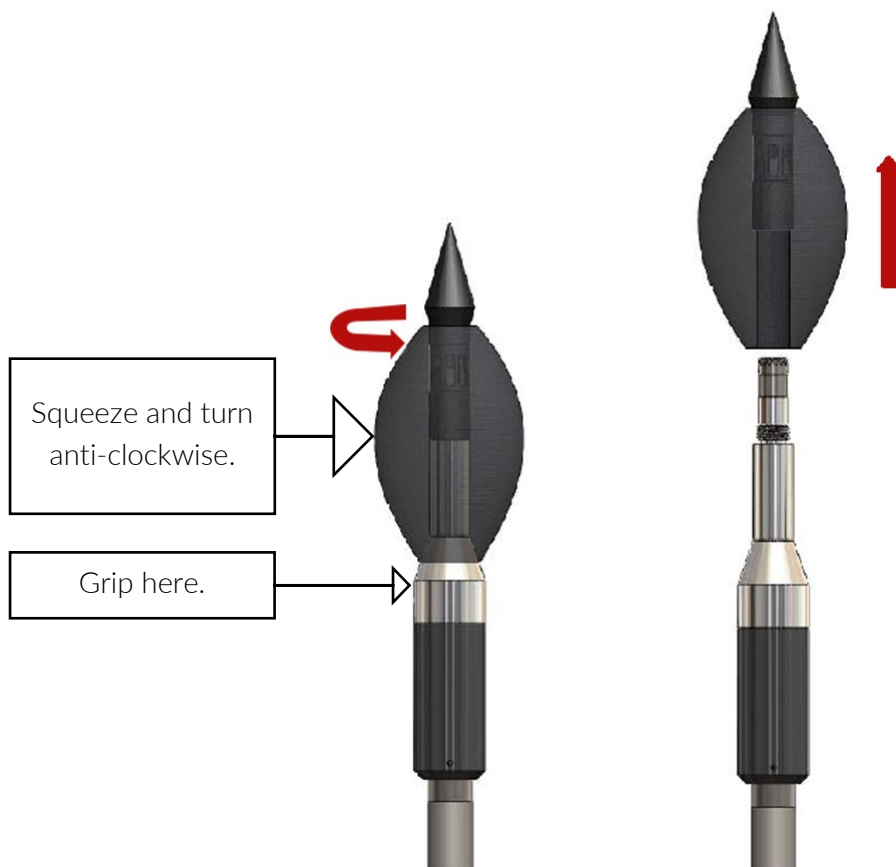
2) Place the acoustic calibrator onto the microphone. Switch the calibrator on.

3) Check the current measuring accuracy by accessing the Quantum portal on your mobile device and go to *Live Data > Overview*. Check the noise level measurement: for a CR:515 calibrator, this should read 93.7dB.

4) Select the instrument to calibrate from the right-hand side. A popup similar to that shown below will appear.

6) This will create an internal offset within the Quantum Outdoor unit to adjust the level to 93.7dB (for a 94dB pressure field calibrator).

7   System integrity Check (SiC)

The Cirrus Research System Integrity Check (SiC) performs an integrity check of the noise signal path. A reference signal is injected between the microphone and the preamplifier. This check provides full verification of the preamplifier and noise monitor and partial verification of the microphone. Microphone checks are limited to changes in the capacitance of the microphone, which may include damage to the membrane or loss of charge.

A system check can be initiated manually via the Quantum portal or scheduled via the instrument settings page

It is recommended that system checks are performed when background noise is low, typically at night. Background noise levels should be less than 75 dB.

During the SiC, notifications are disabled to avoid erroneous noise triggers and reenabled at the end. Checks are performed at 500 Hz, 1kHz and 8kHz, with results stored on MyCirrus and available to view and export from the Quantum portal.

System check errors are calculated by comparing the levels against a reference system check. To store a reference system check, view the system integrity results on Quantum cloud, select the desired measurement and click on 'set reference'.

If any deviation is identified, we recommend an initial investigation is performed by following the acoustic check and calibration guidelines as per section 6.

8   GPS

Each Quantum Outdoor unit's location is updated as per its GPS location. The position is reported in the Quantum portal and can be manually checked using the Map view.

8   GPS

9   Time

The Quantum Outdoor's internal clock is synchronised and maintained at UTC time. The time is synchronised through the network connection and corrected to maintain internal clock accuracy to within 1 second of network time.

All live and historical data viewed on the Quantum portal is corrected to the time zone of the device being used to view the portal. Therefore, the UTC time data of the Quantum will be viewed as the local time of the computer being used to access the Quantum portal and/or MyCirrus.

Measurements exported to NoiseTools will be displayed as UTC time. Therefore, there may be a deviation between measurement times displayed on the cloud and NoiseTools, depending on time zone and any daylight-saving time changes.

10 LED indicator

A simple LED indicator assists with the installation of the Quantum Outdoor unit and any connection issues. To view the LED, unscrew the four screws securing the enclosure on the front and remove.

This will expose the unit inner front plate and status LED.

The LED may show a number of states depending on the device's status:

LED off	Unit is powered off
Solid green	Unit is powered, connected to the internet and linked to a MyCirrus account
Pulsing green	Factory default, waiting for login
Flashing green	Location deacon
Solid amber	Initialising - Quantum is starting up
Flashing amber	Updating Quantum unit
Solid red	Contact your local support representative
Pulsing red	Can't connect to MyCirrus, Check internet access and firewall settings
Flash red	No local network

11 Weather station connecting and mounting (optional)

Two optional weather stations can be added to Quantum Outdoor to include weather measurement support.

MO:901 – weather station with wind speed, direction, humidity, rain, and temperature.
MO:902 – wind speed and direction.

The MO:901 is supplied with a weather station, including a 500mm (19.68") support tube and cable for connection to the Quantum Outdoor.

The MO:902 is supplied with a wind sensor and cable for connection to the Quantum Outdoor.

The MO:901 and MO:902 use an ultrasonic wind speed and direction sensor, so they must be installed in the correct orientation. The small directional arrows on the weather station should point to the north, as shown below.
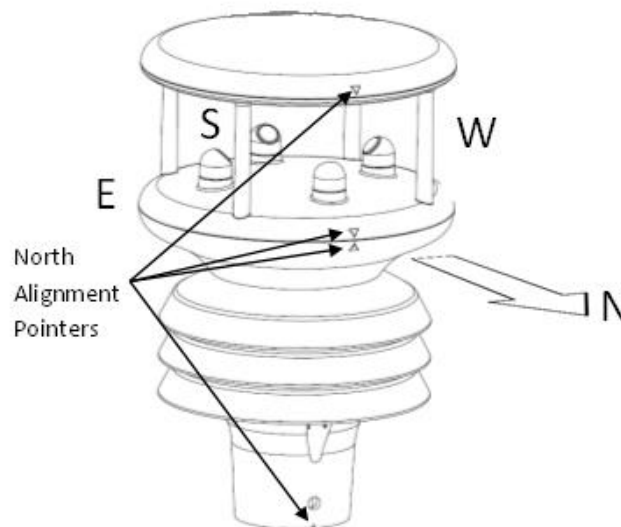
To mount the weather station or windspeed sensor to a pole, an optional pole mount bracket can be purchased (BK:902), which is suitable for poles with diameters between 30 and 58 mm (1.2" – 2.3"). The weather station should be secured to the bracket with screws (torque screws to 1.5 Nm maximum). Mount the bracket to the pole using the clamp nuts (torque set to 3 Nm).
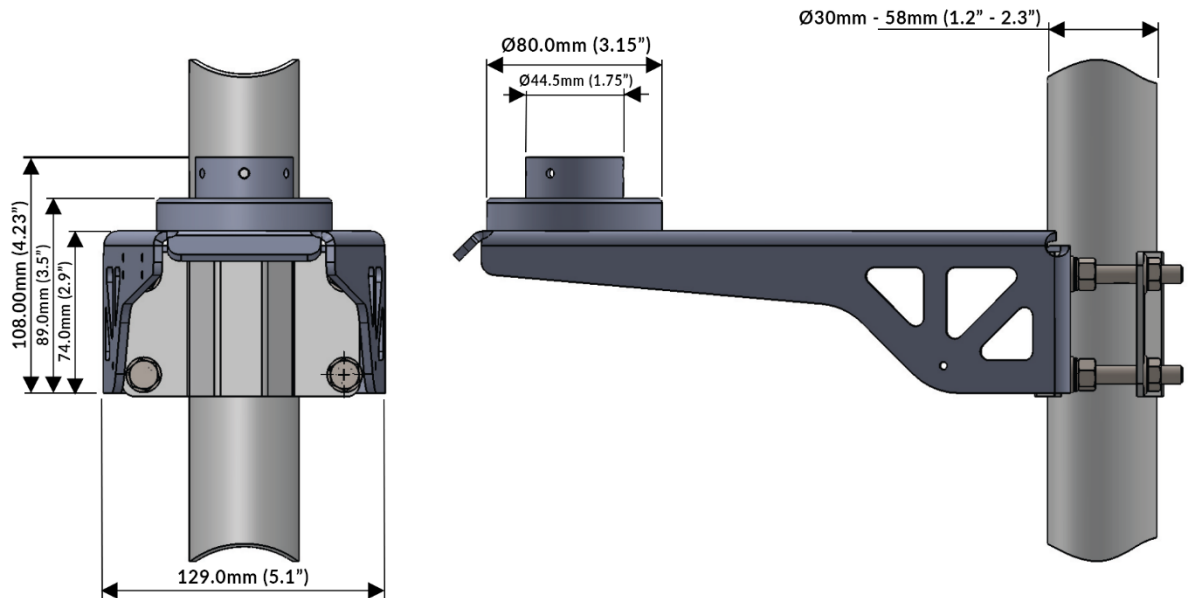
11.1 Weather station - general installation guidelines

For optimal performance, it is recommended to follow these installation guidelines:

- Mount away from other equipment, which may not conform to current standards, e.g., radio/radar transmitters, boat engines, generators etc.
- Avoid turbulence caused by surrounding structures, e.g., trees, buildings, masts etc.
- Mount as high as possible so that the sensor has clear sight of prevailing winds
- The weather station should be mounted as level as possible
- There should be a clear view of the sky above the station for the solid-state rain detector to work correctly

Any pole should be connected to earth, and the mounting bracket should be earthed with a suitable cable.

Please note: The solid-state optical rain sensor provides a general indication of rainfall levels only.

11.2 Weather Station – Dimensions

MO:901

MO:902

Ø142mm (5.6")

82mm (3.2")

163 mm (6.4")

North indicator arrows

M5 fixing screws and washers (supplied)

North alignment notch

9-way mating connector (supplied)

Ø44.45mm (1.75")

120°

120°   120°

7.5mm (0.29")

M5 threaded hole

Mounting pipe dimensions showing the size and position of the 3 mounting holes
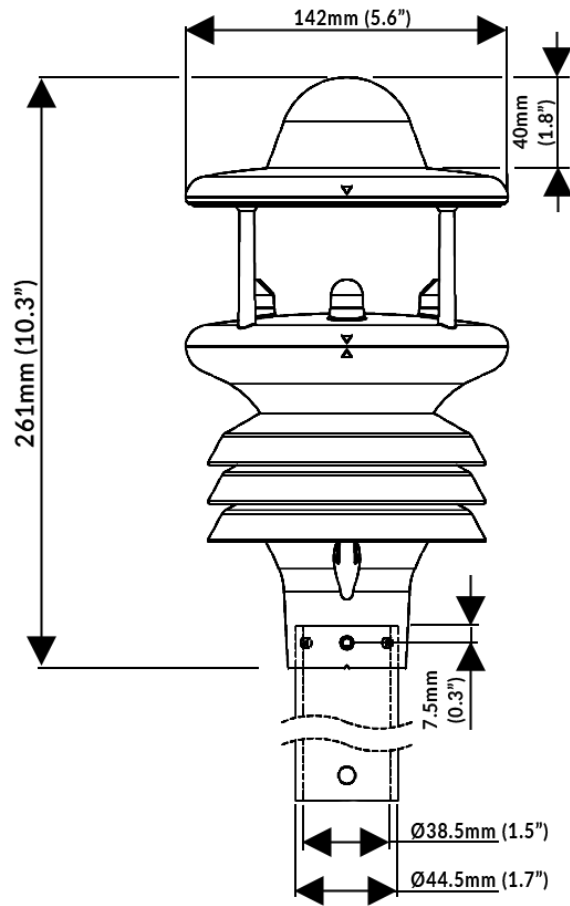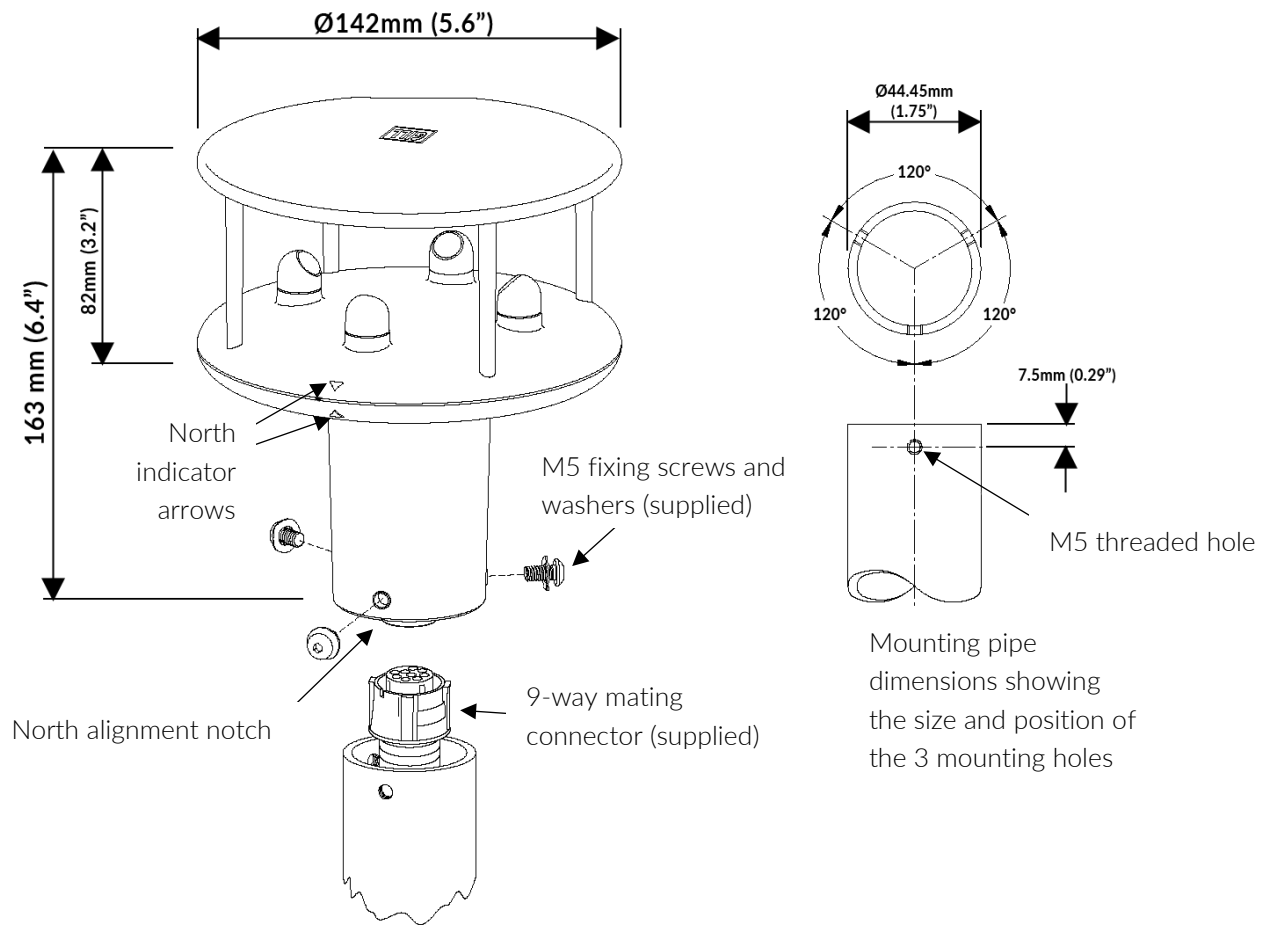
12 Outdoor all-weather PSU (CU:920)

As an alternative option to PoE or as a backup, Quantum Outdoor can be powered from a 12V DC adaptor (CU:920).

Output: 12V dc 1.5 Amp power supply (4-way Lemo)
Input: 100-240Vac 50/60Hz (options include 16A, UK, EU, AUS, US)
IP rating: IP67
Fuse output: F1.5A quick blow, Ø5 x 20mm
Cable length: Mains cable 2m, 12Vdc 10m
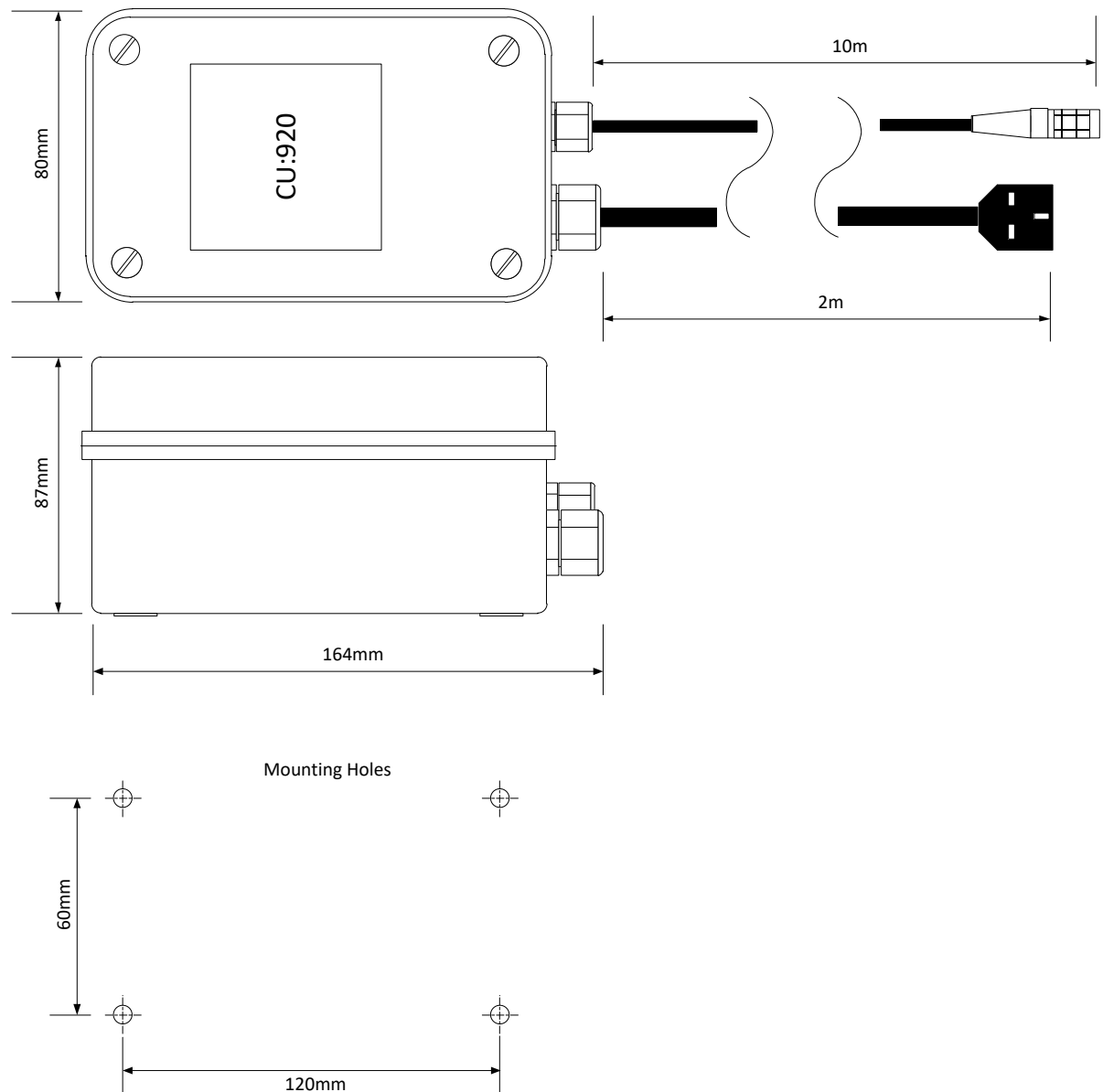
The CU:920 should be connected via a fused and/or RCD trip.

Always isolate mains power before removing the cover.

No serviceable parts inside.

The CU:920 unit and cables should be mounted to prevent damage; if any part of the CU:920 is damaged, it should be disconnected from mains electricity immediately.

13 IEC 61672 test data

Technical data for IEC 61672 testing is contained in the Part B document, which can be downloaded from the Cirrus Research plc website.

14 Common specifications

Applicable standards	
IEC 61672-1:2013 Class 1 or Class 2 Group X	CR:920 CR:920-NA
IEC 60651:2001 Type 1 I or Type 2 I	CR:920 CR:920-NA
ANSI S1.4 -1983 (R2006)	CR:920 CR:920-NA
ANSI S1.43 - 1997 (R2007)	CR:920 CR:920-NA
IEC 61260:1995 & ANSI S1.11-2004 1:1 octave band filters Class 1 or Class 2	CR:920 CR:920-NA
IEC 61260:1995 & ANSI S1.11-2004 1:3 octave band filters Class 1 or Class 2	CR:920 CR:920-NA

Specifications	
Microphone	½" MK:224 pre-polarised free-field electret
Microphone preamplifier	MV:920
Measurement range	20 to 140dB RMS in a single range
Noise floor	<19dB(A) Class 1
Frequency weightings	RMS: A, C, & Z measured simultaneously Peak: A, C, & Z measured simultaneously 1:1 octave bands: 31.5Hz to 16kHz 1:3 octave bands: 6.3Hz to 20kHz
Time weightings	Simultaneous Fast, Slow and Impulse

Specifications	
Measurement control	User-definable scheduled measurements and user-selectable 5min, 15min, 30min, 1hr repeat timers
Time history	User selectable 10ms, 100ms, 500ms, 1 sec
Live data view	Noise at work (LAF, LAeq & LCPeak) Environmental (LAF & LAeq) Custom (LAeq, LCeq, LAFMax, LASMax, LCPeak & LZPeak)
Live data rate	1 sec
Stored values	LAeq, LCeq, LZeq, C-A, LAE, LEX8, LAFMax, LASMax, LCPeak, LZPeak, LAF1, LAF5, LAF10, LAF50, LAF95, LAF99, LAeqT1 & LAeqT2 1:1 octave bands: 31.5Hz to 16kHz 1:3 octave bands: 6.3Hz to 20kHz Time history of 1:1 & 1:3 octave bands
Audio quality	Standard (16bit/16kHz) High (24bit/48kHz)
Integrators	User-selectable dual integrators OSHA HC, OSHA PEL, MSHA HC, MSHA PEL, ACGIH, Custom A and Custom B)
System Integrity Check (SIC)	Three frequency single level charge injection 500Hz, 4kHz and 8kHz
Dimensions	200 x 850 x 122mm (7.8 x 33.5 x 4.8")
Weight	5kg (11 lbs)
Power	PoE IEEE 802.3af-2003 37V – 57V DC 12V – 18V DC 1.5A
Power consumption	<8w
Network connections	4G with 3G fallback factory fitted with industrial multi-network SIM Ethernet Dual-band WiFi (2.4GHz and5GHz) Bluetooth®

Specifications	
Case material	Metal - aluminium
Mounting	BK:901 wall mounting kit Pole mount (standard option)
Temperature	Operating: -10 °C to +50 °C Storage: -20 °C to +60 °C
Humidity	Up to 95% RH non-condensing
Environmental	IP65
Electromagnetic performance	EN 61000-6-3:2007+A1:2011 EN 61000-6-1:2007
Language options	English
Software support	NoiseTools download, configuration and analysis software supplied as standard. Compatible with Microsoft Windows 10 (32 bit & 64 bit) and 11

15 EU Declaration of Conformity

Manufacturer: Cirrus Research plc
Acoustic House
Bridlington Road
North Yorkshire
YO14 0PH
United Kingdom

Equipment description.
The following equipment, manufactured after 1st September 2021:
CR:920
CR:920-NA

According to:
EMC Directive 2014/30/EU
Low Voltage Directive 2014/35/EU
RoHS Directive 2011/65/EU

Meet the following standards:

EN 61000-6-3:2007+A1:2011
Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments

EN 61000-6-1:2007
Electromagnetic compatibility (EMC). Generic standards. Immunity for residential, commercial and light-industrial environments

Auxiliary Industry Standards
EN 61672-1:2013   Electroacoustics – sound level meters
EN 61260:1995   Octave-band filters

Signed   Dated 1st September 2021

Martin Williams, Director

16 Product guarantee and extended warranty

1. Every new product is provided with a 12-month no-quibble warranty. This covers everything we provide against failure, poor workmanship and accidental damage.

NB - European Union law states a product has to be fit for purpose for 24 months after purchase. This two-year period covers failure and poor workmanship only.

2. If the product is calibrated by Cirrus Research or an authorised calibration and service centre, then the initial 12-month warranty is extended by a further 12 months, with the same conditions, for up to 15 years in total.

3. If a product has not been calibrated annually by Cirrus Research or an authorised calibration and service centre, then you may buy back into the warranty scheme for £100 plus the cost of calibration. This can only be done once during the life of the product.

4. If a microphone capsule fails under warranty and is physically damaged, we will replace it with a refurbished capsule.

5. If you don't wish to have a refurbished capsule, then you can trade in your damaged capsule for a new one, which will incur a fee of £150.

Notes

Notes

www.**cirrusresearch.com**
sales@**cirrusresearch.com**